

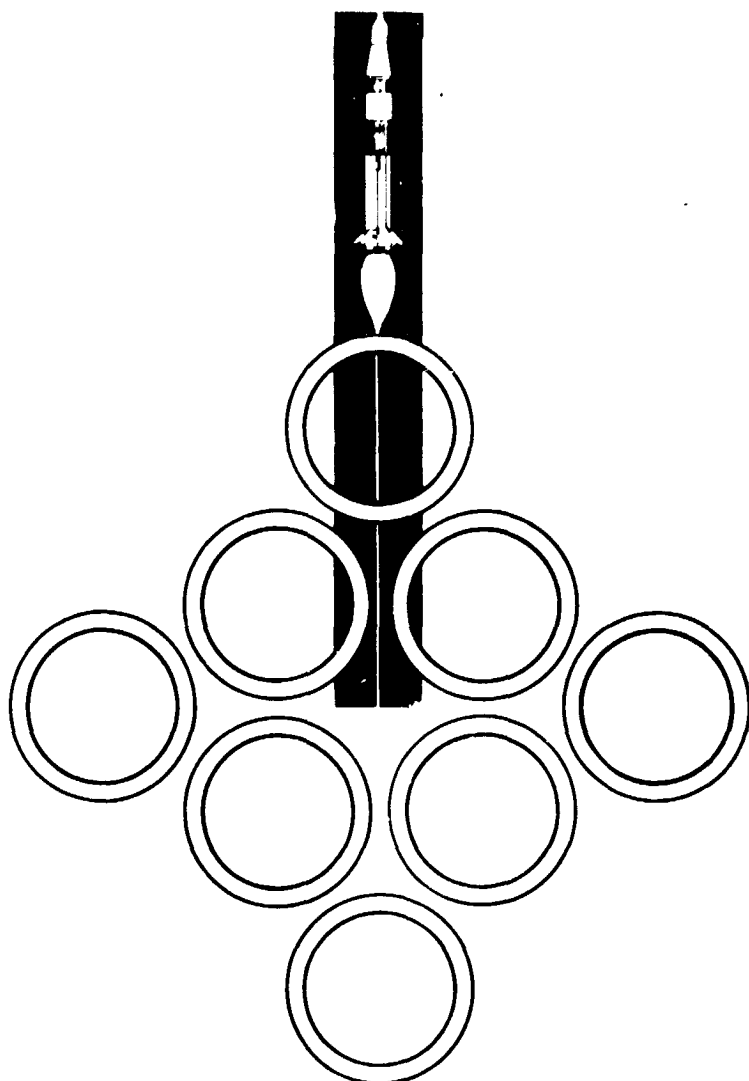
S. J. F.

ENGINEERING DEPARTMENT
TECHNICAL REPORT

TR-RE-CCSD-FO-1029-3

February 8, 1967

SATURN IB PROGRAM



TEST REPORT
FOR
PRESSURE SWITCH

Sigma-Netics, Inc. Part Numbers
704011, 704012, 704013, 704024,
704025, and 704026

NASA Drawing Numbers
75M18354-1, 75M18354-4, 75M18354-7, 75M51766-4,
75M51766-5, and 75M51766-6

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SPACE DIVISION



CHRYSLER
CORPORATION

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75M51766-5, and 75M51766-6

ABSTRACT

This report presents the results of tests performed on 16 pressure switches. The following tests were performed:

- | | |
|-------------------------|-----------------|
| 1. Receiving Inspection | 5. Salt Fog |
| 2. Proof Pressure | 6. Explosion |
| 3. Functional | 7. Seal Leakage |
| 4. Low Temperature | 8. Life Cycle |

Five of the eight specimens conforming to NASA drawing 75M18354 were subjected to a low temperature environment. The specimens did not function satisfactorily during the low temperature test. A vendor representative cleaned, lubricated, and reset the specimens, and the test was then repeated. The specimens again failed to function properly during the test, therefore all eight test specimens were dropped from the test program.

Four of the eight specimens conforming to NASA drawing 75M51766 failed to function properly after being subjected to a salt fog environment for 10 days. Test specimen 4 was disassembled by vendor representatives for inspection. Moisture was detected inside the specimen and a Nylatron bushing had extruded, causing a restriction in the movement of the piston. The specimen was removed from the test program and was returned to the vendor.

Three of the salt fog test specimens were cleaned, lubricated, and reset by CCSD personnel prior to a life cycle test.

Six of the test specimens which were subjected to a life cycle test did not function satisfactorily during all of the functional tests. Specimen 8 was disassembled by vendor representatives for inspection. The backup ring on the piston was not scarf cut. This permitted the O-ring to extrude, thereby restricting the piston movement. The specimen was removed from the test program and was returned to the vendor.

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February 8, 1967

CHRYSLER CORPORATION SPACE DIVISION - NEW ORLEANS, LOUISIANA

3202 -3-2-67

FOREWORD

The tests reported herein were conducted for the John F. Kennedy Space Center by Chrysler Corporation Space Division (CCSD), New Orleans, Louisiana. This document was prepared by CCSD under contract NAS8-4016, Part VII, CWO 271620.

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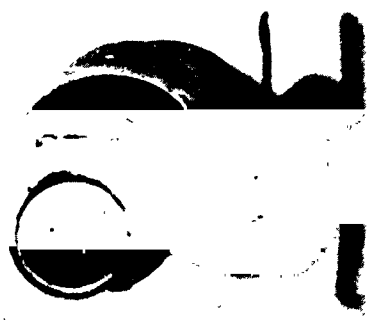
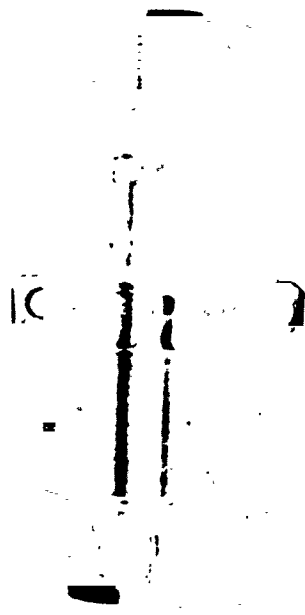
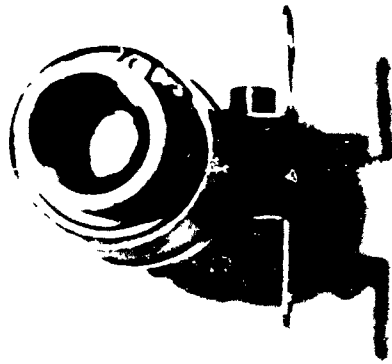
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SIGMA-NETICS, INC.

PRESSURE SWITCH

FO-1029

Pressure Switch

CHECK SHEET
FOR
PRESSURE SWITCH

MANUFACTURER: Sigma-Netics, Inc.

MANUFACTURER'S PART NUMBERS: 704011, 704012, 704013, 704024, 704025,
and 704026

NASA DRAWING NUMBERS: 75M18354-1, 75M18354-4, 75M18354-7, 75M51766-4,
75M51766-5, and 75M51766-6

TEST AGENCY: Chrysler Corporation Space Division, New Orleans, Louisiana

AUTHORIZING AGENCY: NASA KSC

I. FUNCTIONAL REQUIREMENTS

- A. OPERATING MEDIUM: Dry air, gaseous nitrogen, and gaseous helium
- B. OPERATING PRESSURE: Adjustable, with range of 400 to 1000 psig for 704011 and 704024, 1000 to 2000 psig for 704012 and 704025, and 2000 to 3000 psig for 704013 and 704026
- C. LEAKAGE: Bubble-tight at 4500 psig
- D. PROOF PRESSURE: 4500 psig for 704011 and 704024, 6000 psig for 704012, 704013, 704025, and 704026
- E. BURST PRESSURE: Twice the proof pressure
- F. CONTACT RATING: 5 amperes, DC-resistive

II. CONSTRUCTION, MECHANICAL

- A. PRESSURE ELEMENT: Spring-returned pneumatic piston
- B. PNEUMATIC CONNECTION: MC240-4
- C. WEIGHT: Information not available

III. CONSTRUCTION, ELECTRICAL

- A. CONNECTOR: MS33678-10SL-3P
- B. CONTACT VOLTAGE DROP: 0.300-volt maximum at rated load

IV. ENVIRONMENTAL CHARACTERISTICS - MANUFACTURER'S SPECIFICATIONS

- A. TEMPERATURE RANGE: 5°F to 160°F

V. LOCATION AND USE

- A. LOCATION: Saturn IB GSE, LC34 and LC37, Apollo Access Arm
- B. USE: Gas pressure or absence indicator

TEST SUMMARY
PRESSURE SWITCH
75M18354

Environment	Unit	Operational Boundary	Test Objective	Test Results	Remarks			
Receiving Inspection	1	Visual Examination	To determine if specimens conform with applicable drawings and specifications	S				
	2			S				
	3			S				
	4			S				
	5			S				
	6			S				
	7			S				
	8			S				
Proof Pressure Test	1	4500 psig	Maintain 4500 psig	S				
	2	for 5 minutes		S				
	3			S				
	4	6000 psig for 5 minutes	Maintain 6000 psig	S				
	5			S				
	6			S				
	7			S				
	8			S				
Functional Test	1	Actuate at 700	Actuate and deactuate test specimens at specified levels	S	Improper actuation and deactuation pressures			
	2	psig maximum;		S				
	3	deactuate at 620 (+10) psig		S				
	4	Actuate at 1440		U				
	5	psig maximum;		U				
	6	deactuate at 1345 (+15) psig		U				
	7	Actuate at 2900		U				
		psig maximum;						
	8	deactuate at 2690 (+20) psig		S				
	b. Contact Voltage Drop	1		Apply a 5-Ampere		Voltage drop shall not exceed 300 millivolts	S	
		2		28-vdc resistive			S	
		3		load across			S	
4		closed contacts	S					

TEST SUMMARY

PRESSURE SWITCH

75M18354

(CONTINUED)

Environment	Unit	Operational Boundary	Test Objective	Test Results	Remarks
c. Insulation Resistance	5	500-vdc applied between nonconnected pins and between each pin and switch	Insulation resistance not less than 20 megohms	S	
	6			S	
	7			S	
	8			S	
	1			S	
	2			S	
	3			S	
	4			S	
d. Dielectric Strength	5	1000-vac (rms), 60 cps applied between nonconnected pins and between each pin and switch case	Leakage current not greater than 5 milliamperes	S	
	6			S	
	7			S	
	8			S	
	1			S	
	2			S	
	3			S	
	4			S	
First Low Temperature Test	5	Stabilize at 5 °F, perform a functional test at low temperature and after returning to ambient conditions	Determine operating ability at low temperature and after returning to ambient conditions	U	Improper actuation and deactuation pressures
	8			U	
	1			U	
	2			U	
Second Low Temperature Test	4			U	Improper actuation pressures
	5			U	
	8			U	
	1			U	

TEST SUMMARY
PRESSURE SWITCH
75M51766
(CONTINUED)

Environment	Unit	Operational Boundary	Test Objective	Test Results	Remarks
Receiving Inspection	1	Visual	To determine if specimens conform with applicable drawings and specifications	S	
	2	Examination		S	
	3			S	
	4			S	
	5			S	
	6			S	
	7			S	
	8			S	
Proof Pressure Test	1	4500 psig	Maintain 4500 psig	S	
	2	for 5 minutes		S	
	3			S	
	4	6000 psig	Maintain 6000 psig	S	
	5	for 5 minutes		S	
	6			S	
	7			S	
	8			S	
Functional Test a. Actuation and Deactuation	1	Actuate at	Actuate and deactuate test specimens at specified levels	S	Improper actuation Pressures
	2	665 (+10) psig;		S	
	3	deactuate at 597 psig minimum		U	
	4	Actuate at		U	
	5	1410 (+15) psig;		U	
	6	deactuate at 1286 psig minimum		U	
	7	Actuate at 2850 (+20) psig, deactuate at		U	
	8	2586 psig minimum		U	
	b. Contact Voltage Drop	1	Apply a 5-ampere	S	
		2	28-vdc resistive	S	
		3	load across	S	
		4	closed contacts	S	
			Voltage drop shall not exceed 300 millivolts		

TEST SUMMARY

PRESSURE SWITCH

75M51766

(CONTINUED)

Environment	Unit	Operational Boundary	Test Objective	Test Results	Remarks
c. Insulation Resistance	5	500 vdc applied between nonconnected pins and between each pin and switch case.	Insulation resistance not less than 20 megohms	S	
	6			S	
	7			S	
	8			S	
	1			S	
	2			S	
	3			S	
	4			S	
d. Dielectric Strength	5	1000 vac (rms) 60 cps applied between nonconnected pins and between each pin and switch case	Leakage current not greater than 5 milliamperes	S	
	6			S	
	7			S	
	8			S	
	1			S	
	2			S	
	3			S	
	4			S	
Salt Fog Test	5	5% by weight mixture salt solution, maintain for 240 hours at 95°F	Determine performance after being subjected to salt fog environment	U	Improper actuation and deactuation pressures; Insulation resistance below 1 megohm
	7			U	
				U	
				U	
				U	
Seal Leakage Test	1	Pressurize to 4500 psig	Check for external leakage using leak detector solution	S	
	2			S	
	3			S	
	5			S	
	6			S	
	7			S	
	8			S	

TEST SUMMARY

PRESSURE SWITCH

75M51766

(CONTINUED)

Environment	Unit	Operational Boundary	Test Objective	Test Results	Remarks
Life Cycle Test	1	Actuate and deactuate each switch for 10,000 cycles	Determine effect of continuous operation on switch performance	S	Improper actuation and deactuation pressures
	2			U	
	3			U	
	5			U	
	6			U	
	7			U	
	8			U	
Explosion Test	1	32% by volume hydrogen, 160°F at 13.1 psig	Operate switch in explosive atmosphere	S	
	5			S	
	7			S	

S - Satisfactory
 U - Unsatisfactory

SECTION I

INTRODUCTION

1.1 SCOPE

- 1.1.1 This report presents the results of tests that were performed to determine if pressure switch 75M18354 and pressure switch 75M51766 meet the operational and environmental requirements of the John F. Kennedy Space Center. A summary of the test results is presented on pages ix through xiii.
- 1.1.2 Sixteen pressure switches were tested, of which eight were 75M18354 switches, and the other eight were 75M51766 switches. There were three each of the 75M18354-1, 75M18354-4, 75M51766-4, and 75M51766-5 switches, and two each of the 75M18354-7 and 75M51766-6 switches.

1.2 ITEM DESCRIPTION

- 1.2.1 Pressure switches 75M18354-1, 75M18354-4, and 75M18354-7 are manufactured by Sigma-Netics, Inc., as part numbers 704011, 704012, and 704013, respectively. The switches are adjustable and differ only in pressure range. Pressure switches 75M51766-4, 75M51766-5, and 75M51766-6 are manufactured by Sigma-Netics, Inc., as part numbers 704024, 704025, and 704026, respectively. The switches are adjustable and differ only in pressure range. Switches 704011 and 704024 have a range of 400 to 1000 psig. Switches 704012 and 704025 have a range of 1000 to 2000 psig. Switches 704013 and 704026 have a range of 2000 to 3000 psig.
- 1.2.2 All models of the switches are mounted by a standard 1/4-inch tube fitting with the additional support of a footed clamp ring. The switches will be used in the swing-arm of Launch Complex 34 at John F. Kennedy Space Center.

1.3 APPLICABLE DOCUMENTS

The following documents contain the test requirements for pressure switches 75M18354 and 75M51766:

- a. KSC-STD-164 (D), Standard Environmental Test Methods for Ground Support Equipment Installations at Cape Kennedy.
- b. NASA Drawings 75M18354 and 75M51766.
- c. Test Plan CCSD-FO-1029-1R.

1.4

SPECIMEN ASSIGNMENT

The specimen assignment numbers are as follows:

<u>Specimen</u>	<u>NASA Part Number</u>
1,2,3	75M18354-1, 75M51766-4
4,5,6	75M18354-4, 75M51766-5
7,8	75M18354-7, 75M51766-6

SECTION II
RECEIVING INSPECTION

2.1 TEST REQUIREMENTS

Each specimen shall be visually and dimensionally inspected for conformance with the applicable specifications prior to testing.

2.2 TEST PROCEDURE

A visual and dimensional inspection was performed to determine compliance with NASA drawings 75M18354 and 75M51766, and to the applicable vendor drawings, to the extent possible without disassembly of the test specimens. At the same time, each test specimen was also inspected for poor workmanship and manufacturing defects.

2.3 TEST RESULTS

The specimens were found to conform with all applicable drawings and specifications.

SECTION III

PROOF PRESSURE TEST (75M18354)

3.1 TEST REQUIREMENTS

- 3.1.1 Switch 75M18354-1 shall be pressurized to 4500 psig for 5 minutes, using gaseous helium. Switches 75M18354-4 and 75M18354-7 shall be pressurized to 6000 psig for 5 minutes, using gaseous helium.
- 3.1.2 The test specimens shall be inspected for leakage and external damage.

3.2 TEST PROCEDURE

- 3.2.1 The test setup was assembled as shown in figure 3-1, using the equipment listed in table 3-1.
- 3.2.2 The test specimens were pressurized to their rated proof pressures by closing hand valve 5 and adjusting pressure regulator 3.
- 3.2.3 The specimens were checked for leakage during the 5-minute period by monitoring gage 4 for an indication of a pressure drop at the specimen. The initial and final pressures were recorded.
- 3.2.4 Pressure regulator 3 was closed and hand valve 5 was opened to depressurize the specimen.
- 3.2.5 The specimen was removed from the test setup and inspected for damage.

3.3 TEST RESULTS

There was no leakage of the test specimens, and there was no evidence of internal or external damage.

3.4 TEST DATA

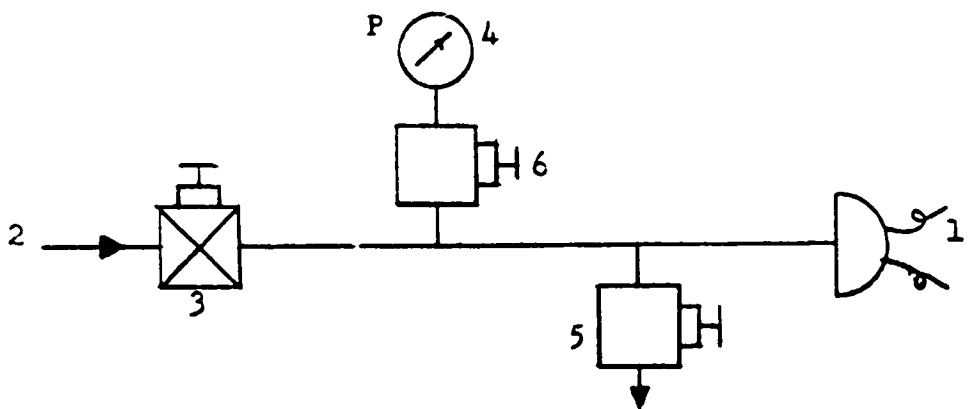
The test data presented in table 3-2 were recorded during the test.

Table 3-1. Proof Pressure Test Equipment List

Item No.	Item	Manufacturer	Model/ Part No.	Serial No.	Remarks
1	Test Specimen	Sigma-Netics, Inc.	704011 704012 704013	C15, C16, C17 C14, C15 C16 D3, D4	Pressure Switch
2	Helium Supply	NA	NA	NA	6000-psig
3	Pressure Regulator	Tescom Corp.	26-1002	1009	6000-psi
4	Pressure Gage	Duragauge	NA	NA	0-to 10,000-psig +0.5% FS accuracy Cal. date 9-7-66
5	Hand Valve	Robbins	ANA250-4T	NA	1/4-inch
6	Hand Valve	Robbins	ANA250-4T	NA	1/4-inch

Table 3-2. Proof Pressure Test Data (75M18354)

Specimen Number	Pressure (psig)	Time (minutes)	Leakage	External Damage
1	4500	5	None	None
2	4500	5	None	None
3	4500	5	None	None
4	6000	5	None	None
5	6000	5	None	None
6	6000	5	None	None
7	6000	5	None	None
8	6000	5	None	None



NOTE: Refer to table 3-1 for item identification.
All line sizes 1/4-inch.

Figure 3-1. Proof Pressure Test Schematic

SECTION IV

FUNCTIONAL TEST (75M18354)

4.1 TEST REQUIREMENTS

- 4.1.1 Actuation of the test specimens shall occur at the following pressures, using gaseous helium as the pressure medium:

75M18354-1	700-psig maximum
75M18354-4	1440-psig maximum
75M18354-7	2900-psig maximum

- 4.1.2 Deactuation shall occur at the following pressures:

75M18354-1	620 (\pm 10) psig
75M18354-4	1345 (\pm 15) psig
75M18354-7	2690 (\pm 20) psig

- 4.1.3 Contact voltage drop across the normally open and the normally closed contacts shall not exceed 300 millivolts when the contacts are closed, except after the life cycle test when a 500-millivolt drop is allowable.
- 4.1.4 The insulation resistance measured between all nonconnected pins and between each pin and case shall not be less than 20 megohms with 500-vdc applied.
- 4.1.5 The dielectric strength shall be such that the leakage current shall not exceed 5 milliamps when 1000 vac (rms), 60 cps is applied.

4.2 TEST PROCEDURE

- 4.2.1 The test setup was assembled as shown in figures 4-1 and 4-2, using all the equipment listed in table 4-1 except items 9 through 13.
- 4.2.2 Hand valves 3 and 5 were opened and the system was purged of air, using a low flow from regulated pressure source 2. Hand valve 5 was closed and the regulated source pressure was reduced to zero.
- 4.2.3 The regulated source pressure was slowly increased until the specimen actuated. The actuation pressure was recorded.
- 4.2.4 The regulated source pressure was slowly decreased until the specimen deactuated. The deactuation pressure was recorded and the pressure was reduced to zero.

- 4.2.5 Steps 4.2.3 and 4.2.4 were repeated until each test specimen was actuated and deactivated five times.
- 4.2.6 Lamps 7 and 8 were removed from the test setup and replaced with load banks 12 which were adjusted to a 5-ampere load at 28-vdc.
- 4.2.7 Differential voltmeter 9 was connected across pins A and B of J1, and the contact voltage drop across the normally-closed contacts was measured and recorded.
- 4.2.8 The regulated source pressure was increased until the test specimen actuated. Differential voltmeter 9 was connected across pins B and C of J1, and the contact voltage drop across the normally-open contacts was measured and recorded. The regulated pressure was reduced to zero.
- 4.2.9 Steps 4.2.7 and 4.2.8 were repeated until each test specimen was actuated five times.
- 4.2.10 Connector P1 was disconnected from receptacle J2 (figure 4-2).
- 4.2.11 Megohmmeter 11 was connected to pins B and C of J1, and with 500-vdc applied to the pins the insulation resistance was measured and recorded.
- 4.2.12 Megohmmeter 11 was connected to pins A and C of J1, and the test specimen was actuated. The 500-vdc test voltage was applied and the insulation resistance measured and recorded.
- 4.2.13 The insulation resistance between each pin of J1 and the test specimen case was measured and recorded by applying 500-vdc between the pins and case.
- 4.2.14 The megohmmeter was removed and the insulation tester 10 was connected between J1 pins A to C and case, with the test specimen in the actuated position.
- 4.2.15 The test voltage was gradually increased from zero to 1000-vac (rms) and was maintained for 60 seconds. The highest leakage current was recorded.
- 4.2.16 The regulated source pressure was reduced to zero and the insulation tester was connected between J1 pins B to C and case. Step 4.2.15 was repeated.

4.3 TEST RESULTS

- 4.3.1 Specimens 1, 2, 3, and 8 functioned properly during the test.

4.3.2 Specimens 4, 5, and 7 deactuated below the pressures specified in 4.1.2, and specimen 6 actuated above the pressure specified in 4.1.1.

4.4 TEST DATA

4.4.1 The insulation resistance was greater than 20 megohms for all test specimens.

4.4.2 The dielectric strength (leakage current) was less than 5 milliamps for all test specimens.

4.4.3 Data recorded during the functional test is presented in table 4-2.

Table 4-1. Functional Test Equipment List

Item No.	Item	Manufacturer	Model/ Part No.	Serial No.	Remarks
1	Test Specimen	Sigma-Netics, Inc.	704011 704012 70413	C15, C16 C17 C14, C15 C16 D3, D4	Pressure switch
2	Pressure Source Regulated	NA	NA	NA	6000-psi, helium
3	Hand Valve	Robbins	ANA250-4T	NA	$\frac{1}{4}$ -inch
4	Pressure Gage	Martin Decker	NA	NA	0-to 1500-psig $\pm 0.1\%$ FS accuracy Cal. date 1-5-67
4	Pressure Gage	Seegers	SS2170-4000	S-1771	0-to 4000-psig $\pm 0.1\%$ FS accuracy Cal. date 9-1-66
4	Pressure Gage	Heise	H34949	014225	0-to 1000-psig $\pm 0.1\%$ FS accuracy Cal. date 1-9-67
5	Hand Valve	Robbins	ANA250-4T	NA	$\frac{1}{4}$ -inch
6	Power Source	Lambda	LA5003B	010270	28-vdc
7	Lamp	General Electric	327	NA	Green
8	Lamp	General Electric	327	NA	Orange
9	Differential Voltmeter	John Fluke	821A	156	$\pm 0.1\%$ FS accuracy
10	Insulation Tester	Wiley	Model 5	015241	
11	Megohmmeter	General Radio	1862-B	01845	
12	Load Bank	CCSD	NA	NA	5-amp, 28-vdc
13	Ammeter	Simpson	NA	NA	0-to 10-amp (built into load banks)

Table 4-2. Initial Functional Test Data (75M18354)

Specimen Number	Serial Number	Average Actuation Pressure (psig)	Specified Pressure (psig max.)	Average Deactuation Pressure (psig)	Specified Pressure (psig)
1	C15	680	700	618	620 (\pm 10)
2	C16	679	700	615	620 (\pm 10)
3	C17	657	700	614	620 (\pm 10)
4	C14	1424	1440	1317	1345 (\pm 15)
5	C15	1412	1440	1309	1345 (\pm 15)
6	C16	1445	1440	1333	1345 (\pm 15)
7	D3	2804	2900	2639	2690 (\pm 20)
8	D4	2879	2900	2688	2690 (\pm 20)

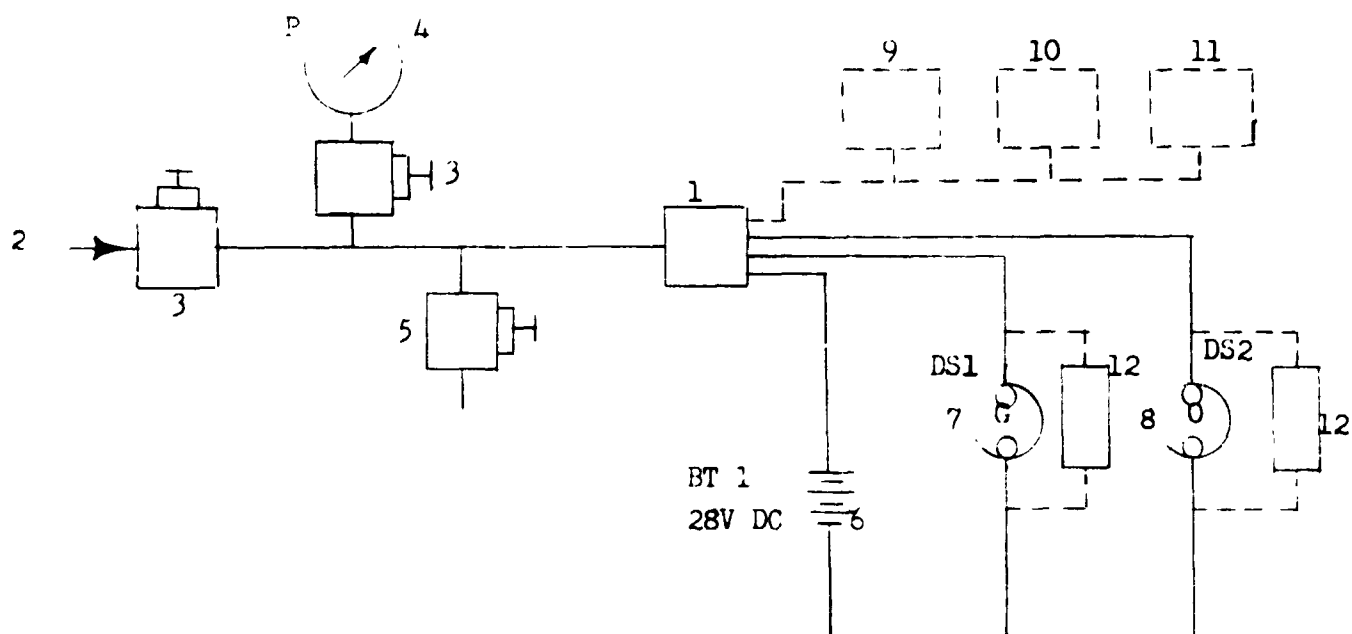


Figure 4-1. Functional Test Schematic

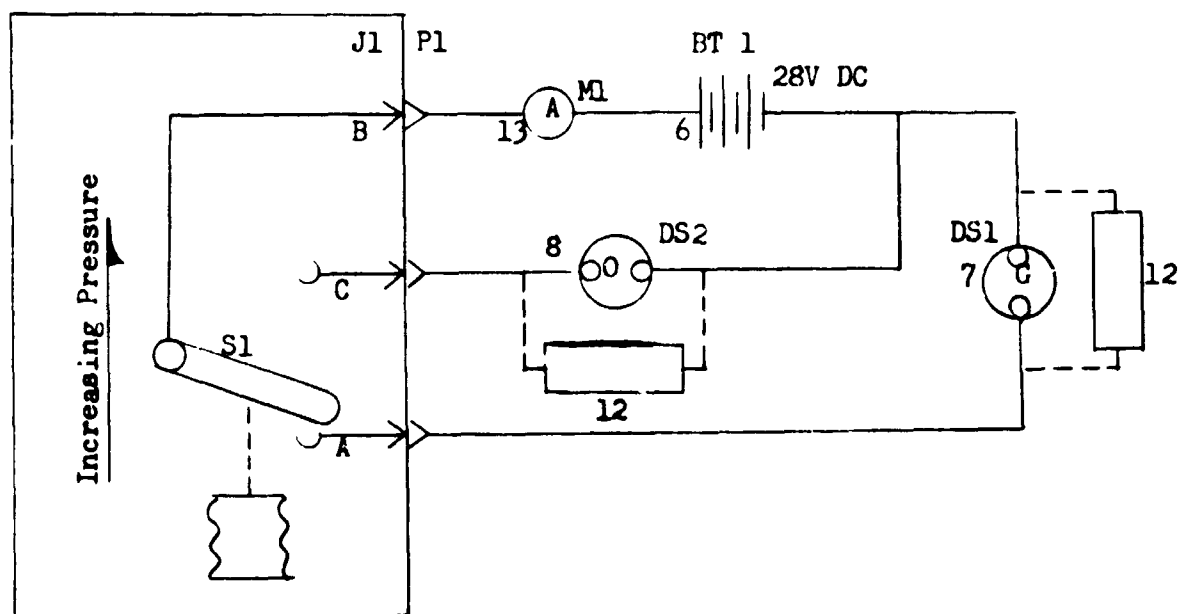


Figure 4-2. Functional Test Wiring Schematic

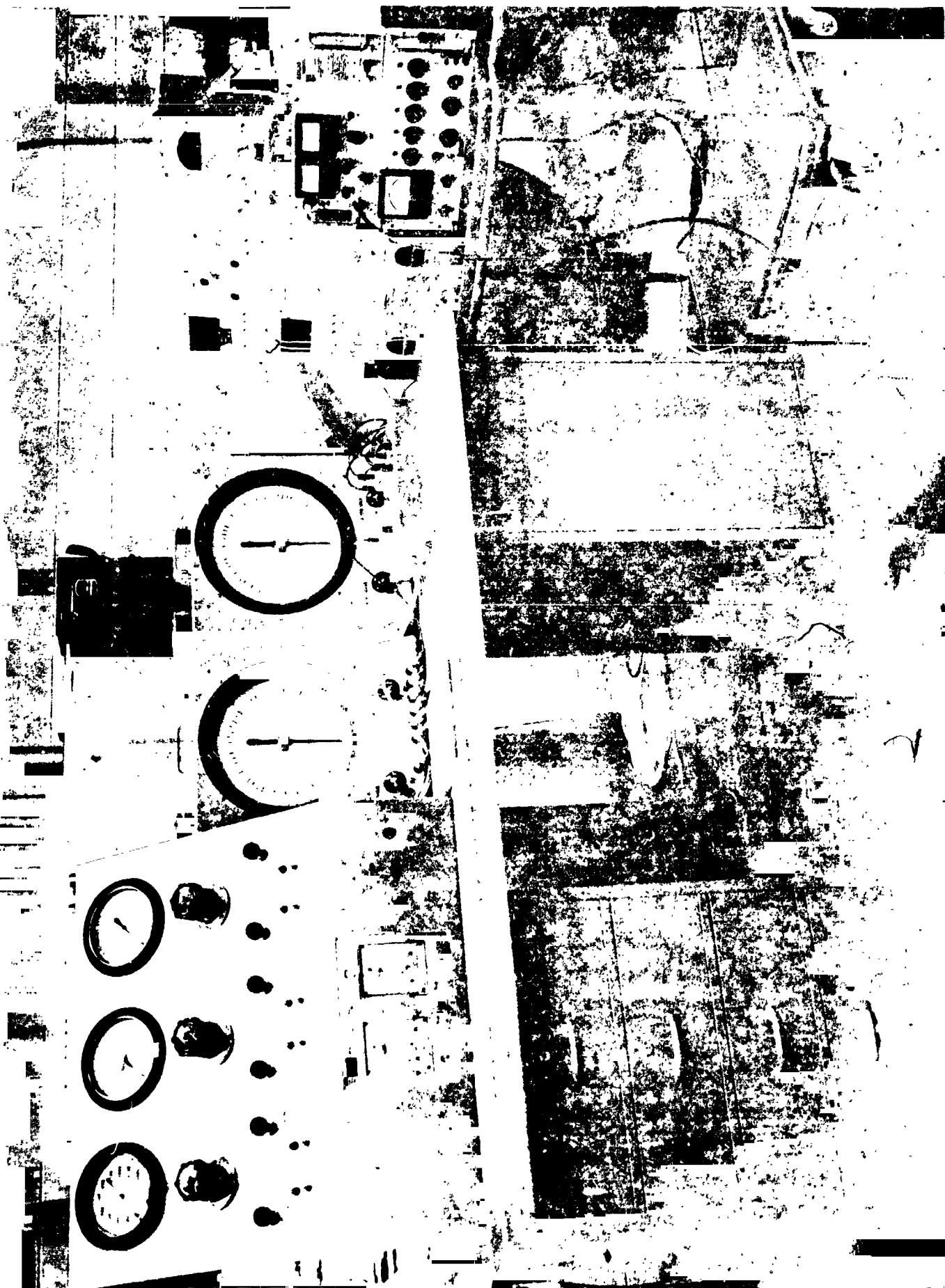


Figure 4-3. Functional Test Setup

SECTION V

LOW TEMPERATURE TEST (75M18354)

5.1 TEST REQUIREMENTS

- 5.1.1 The test specimens shall be subjected to a low temperature test of 5 (+0, -4)°F to determine whether the environment causes degradation or deterioration of the specimens.
- 5.1.2 A functional test as prescribed in section IV shall be performed before the test (if more than 72 hours have elapsed since the last functional test), during the test, and within 1 hour after stabilization at ambient temperature after the test. The dielectric strength test voltage shall be 500-vac (rms).

5.2 TEST PROCEDURE

- 5.2.1 The test specimens were placed in the low temperature chamber and all necessary electrical and pneumatic systems were connected as shown in figures 4-1 and 4-2.
- 5.2.2 The chamber temperature was decreased at the rate of one degree per minute and stabilized at 5 (+0, -4)°F.
- 5.2.3 A functional test (refer to 5.1.2) was performed when temperature stabilization was attained.
- 5.2.4 The chamber temperature was returned to ambient conditions upon completion of the functional test.
- 5.2.5 The test specimens were visually inspected and functionally tested within 1 hour following the return to ambient.

5.3 TEST RESULTS

- 5.3.1 Specimens 1, 4, and 5 actuated above the pressures specified in 4.1.1 during the low-temperature test.
- 5.3.2 Specimens 2 and 4 deactuated above and specimen 8 deactuated below the pressure specified in 4.1.2 during the low temperature test.
- 5.3.3 Specimens 4, 5, and 8 deactuated below the pressures specified in 4.1.2 after the low-temperature test.
- 5.3.4 The test specimens were cleaned, lubricated, and reset by a vendor representative. The low temperature test was repeated and the test specimens all actuated above the pressures specified in 4.1.1 during the low-temperature functional test.

5.4 TEST DATA

- 5.4.1 Test data recorded during and after the low-temperature tests are presented in tables 5-1 through 5-4.
- 5.4.2 The insulation resistance was greater than 20 megohms for all test specimens.
- 5.4.3 The dielectric strength (leakage current) was less than 5 milliamps for all test specimens.

Table 5-1. Functional Test Data Obtained During First Low Temperature Test (75M18354)

Specimen Number	Serial Number	Average Actuation Pressure (psig)	Specified Pressure (psig max)	Average Deactuation Pressure (psig)	Specified Pressure (psig)
1	C15	712	700	661	620 (± 10)
2	C16	690	700	647	620 (± 10)
4	C14	1463	1440	1388	1345 (± 15)
5	C15	1446	1440	1339	1345 (± 15)
8	D4	2989	2900	2989	2690 (± 20)

Table 5-2. Functional Test Data Obtained After First Low Temperature Test (75M18354)

Specimen Number	Serial Number	Average Actuation Pressure (psig)	Specified Pressure (psig max)	Average Deactuation Pressure (psig)	Specified Pressure (psig)
1	C15	673	700	624	620 (± 10)
2	C16	674	700	614	620 (± 10)
4	C14	1424	1440	1324	1345 (± 15)
5	C15	1408	1440	1307	1345 (± 15)
8	D4	2810	2900	2630	2690 (± 20)

Table 5-3. Functional Test Data Obtained Before Second Low Temperature Test (75M18354)

Specimen Number	Serial Number	Average Actuation Pressure (psig)	Specified Pressure (psig max)	Average Deactuation Pressure (psig)	Specified Pressure (psig)
1	C15	689	700	603	620 (\pm 10)
2	C16	692	700	618	620 (\pm 10)
4	C14	1427	1440	1336	1345 (\pm 15)
5	C15	1439	1440	1347	1345 (\pm 15)
8	D4	2897	2900	2710	2690 (\pm 20)

Table 5-4. Functional Test Data Obtained During Second Low Temperature Test (75M18354)

Specimen Number	Serial Number	Average Actuation Pressure (psig)	Specified Pressure (psig max)	Average Deactuation Pressure (psig)	Specified Pressure (psig)
1	C15	730	700	620	620 (\pm 10)
2	C16	719	700	630	620 (\pm 10)
4	C14	1530	1440	1345	1345 (\pm 15)
5	C15	1508	1440	1340	1345 (\pm 15)
8	D4	3082	2900	2600	2690 (\pm 20)

SECTION VI

PROOF PRESSURE TEST (75M51766)

6.1 TEST REQUIREMENTS

- 6.1.1 Switch 75M51766-4 shall be pressurized to 4500 psig for 5 minutes, using gaseous helium. Switches 75M51766-5 and 75M51766-6 shall be pressurized to 6000 psig for 5 minutes, using gaseous helium.
- 6.1.2 The test specimens shall be inspected for leakage and external damage.

6.2 TEST PROCEDURE

- 6.2.1 The test setup was assembled as shown in figure 3-1, using the equipment listed in table 6-1.
- 6.2.2 The test specimens were pressurized with helium to their rated proof pressure by closing hand valve 5 and adjusting pressure regulator 3.
- 6.2.3 The specimens were checked for leakage during the 5-minute period by monitoring gage 4 for an indication of a pressure drop at the specimen. The initial and final pressures were recorded.
- 6.2.4 Pressure regulator 3 was closed and hand valve 5 was opened to depressurize the specimen.
- 6.2.5 The specimen was removed from the test setup and inspected for damage.

6.3 TEST RESULTS

There was no leakage of the test specimens and there was no evidence of internal or external damage.

6.4 TEST DATA

The test data presented in table 6-2 were recorded during the test.

Table 6-1. Proof Pressure Test Equipment List

Item No.	Item	Manufacturer	Model/Part No.	Serial No.	Remarks
1	Test Specimen	Sigma-Netics, Inc.	704024 704025 704026	C20, C21, C22 C26, C27 C28 D10, D11	Pressure switch
2	Helium Supply	NA	NA	NA	6000-psig
3	Pressure Regulator	Tescom Corp.	26-1002	1009	6000-psig
4	Pressure Gage	Duragauge	NA	NA	0-to-10,000 psig $\pm 0.5\%$ FS accuracy
5	Hand Valve	Robbins	ANA250-4T	NA	1/4-inch
6	Hand Valve	Robbins	ANA250-4T	NA	1/4-inch

Table 6-2. Proof Pressure Test Data (75M51766)

Specimen Number	Pressure (psig)	Time (minutes)	Leakage	External Damage
1	4500	5	None	None
2	4500	5	None	None
3	4500	5	None	None
4	6000	5	None	None
5	6000	5	None	None
6	6000	5	None	None
7	6000	5	None	None
8	6000	5	None	None

SECTION VII

FUNCTIONAL TEST (75X51766)

7.1 TEST REQUIREMENTS

7.1.1 Actuation of the test specimens shall occur at the following pressures, using gaseous helium as the pressure medium:

75X51766-4	665 (\pm 10) psig
75X51766-5	1410 (\pm 15) psig
75X51766-6	2850 (\pm 20) psig

7.1.2 Deactuation shall occur at the following pressures:

75X51766-4	597-psig minimum
75X51766-5	1236-psig minimum
75X51766-6	2586-psig minimum

7.1.3 Contact voltage drop across the normally open and the normally closed contacts shall not exceed 300 millivolts when the contacts are closed, except after the life cycle test when a 500 millivolt drop is allowable.

7.1.4 The insulation resistance measured between all nonconnected pins and between each pin and case shall not be less than 20 megohms with 500-vdc applied.

7.1.5 The dielectric strength shall be such that the leakage current shall not exceed 5 milliamps when 1000 vac (rms), 60 cps is applied.

7.2 TEST PROCEDURE

7.2.1 The test setup was assembled as shown in figure 4-1 and 4-2, using all the equipment listed in table 7-1 except items 9 through 13.

7.2.2 Hand valves 3 and 5 were opened and the system was purged of air, using a low flow from regulated pressure source 2. Hand valve 5 was closed and the regulated source pressure was reduced to zero.

7.2.3 The regulated source pressure was slowly increased until the specimen actuated. The actuation pressure was recorded.

7.2.4 The regulated source pressure was slowly decreased until the specimen deactuated. The deactuation pressure was recorded and the pressure was reduced to zero.

7.2.5 Procedures described in 7.2.3 and 7.2.4 were repeated until each test specimen was actuated and deactuated five times.

- 7.2.6 Lamps 7 and 8 were removed from the test setup and replaced with load banks 12 which were adjusted to a 5-ampere load at 28-VDC.
- 7.2.7 The differential voltmeter 9 was connected across pins A and B of J1, and the contact voltage drop across the normally-closed contacts was measured and recorded.
- 7.2.8 The regulated source pressure was increased until the test specimen actuated. The differential voltmeter 9 was connected across pins B and C of J1, and the contact voltage drop across the normally open contacts was measured and recorded. The regulated pressure was reduced to zero.
- 7.2.9 Steps 7.2.7 and 7.2.8 were repeated until each test specimen was actuated five times.
- 7.2.10 The electrical portions of the test setup were removed by disconnecting P1 (figure 4-2).
- 7.2.11 Megohmmeter 11 was connected to pins B and C of J1 and, with 500-VDC applied to the pin, the insulation resistance was measured and recorded.
- 7.2.12 Megohmmeter 11 was connected to pins A and C of J1, and the test specimen actuated. The 500-VDC test voltage was applied and the insulation resistance measured and recorded.
- 7.2.13 The insulation resistance between each pin of J1 and the test specimen case was measured and recorded by applying 500-VDC between the pins and case.
- 7.2.14 The megohmmeter was removed and the insulation tester 10 was connected between J1 pins A to C and case, with the test specimen in the actuated position.
- 7.2.15 The test voltage was gradually increased from zero to 1000-VAC (rms) and was maintained for 60 seconds. The highest leakage current was recorded.
- 7.2.16 The regulated source pressure was reduced to zero and the insulation tester was connected between J1 pins B to C and case. Step 7.2.15 was repeated.

7.3 TEST RESULTS

- 7.3.1 Specimens 1 and 2 functioned properly during the test.
- 7.3.2 Specimens 3 and 7 actuated below and specimens 4, 5, 6, and 8 actuated above the pressures specified in 7.1.1. The specimens were reset to the specified pressures.

7.4 TEST DATA

- 7.4.1 Data recorded during the functional test is presented in table 7-2. The reset actuation and deactuation pressures are presented in table 7-3.
- 7.4.2 The insulation resistance was greater than 20 megohms for all test specimens.
- 7.4.3 The dielectric strength (leakage current) was less than 5 milliamps for all test specimens.

Table 7-1. Functional Test Equipment List

Item No.	Item	Manufacturer	Model/ Part No.	Serial No.	Remarks
1	Test Specimen	Sigma-Netics, Inc.	704024 704025 704026	C20, C21, C22 C26, C27, C28 D10, D11	Pressure Switch
2	Pressure Source Regulated	NA	NA	NA	6000-psi, helium
3	Hand Valve	Robbins	ANA250-4T	NA	
4	Pressure Gage	Heise	H34949	014225	0-to 1000-psig +0.1% FS accuracy Cal. date 1-9-67
4	Pressure Gage	Martin Decker	NA	NA	0-to 1500-psig +0.1% FS accuracy Cal. date 1-5-67
4	Pressure Gage	Seegers	SS2170-4000	S-1771	0-to 4000-psig +0.1% FS accuracy Cal. date 3-1-67
5	Hand Valve	Robbins	ANA250-4T	NA	1/4-inch
6	Power Source	Lambda	LA5003EM	010270	28-vdc
7	Lamp	General Electric	327	NA	Green
8	Lamp	General Electric	327	NA	Orange
9	Differential Voltmeter	John Fluke	821A	156	+0.1% FS accuracy
10	Insulation Tester	Wiley	Model 5	015241	
11	Megohmmeter	General Radio	1862-B	01845	
12	Load Bank	CCSD	NA	NA	5-amp, 28-vdc
13	Ammeter	Simpson	NA	NA	0-to 10 amp (built into load banks)

Table 7-2. Initial Functional Test Data (75M51766)

Specimen Number	Serial Number	Average Actuation Pressure (psig)	Specified Pressure (psig)	Average Deactuation Pressure (psig)	Specified Pressure (psig min)
1	C20	665	665 (\pm 10)	613	597
2	C21	665	665 (\pm 10)	609	597
3	C22	653	665 (\pm 10)	602	597
4	C26	1438	1410 (\pm 15)	1314	1286
5	C27	1455	1410 (\pm 15)	1320	1286
6	C28	1449	1410 (\pm 15)	1325	1286
7	D10	2807	2850 (\pm 20)	2665	2586
8	D11	2875	2850 (\pm 20)	2665	2586

Table 7-3. Functional Test Data Obtained After Adjustment of Test Specimens (75M51766)

Specimen Number	Serial Number	Average Actuation Pressure (psig)	Specified Pressure (psig)	Average Deactuation Pressure (psig)	Specified Pressure (psig min)
1	C20	665	665 (\pm 10)	613	597
2	C21	665	665 (\pm 10)	609	597
3	C22	666	665 (\pm 10)	615	597
4	C26	1420	1410 (\pm 15)	1295	1286
5	C27	1423	1410 (\pm 15)	1301	1286
6	C28	1418	1410 (\pm 15)	1314	1286
7	D10	2837	2850 (\pm 20)	2683	2586
8	D11	2860	2850 (\pm 20)	2640	2586

SECTION VIII

SALT FOG TEST (75M51766)

8.1 TEST REQUIREMENTS

- 8.1.1 The test specimens shall be subjected to a salt fog test to determine the extent, if any, of the degradation or deterioration resulting from the environmental exposure.
- 8.1.2 The salt solution shall be a 5 per cent by weight mixture and shall have a pH factor of 6.5 to 7.2. Test temperature shall be 95 (+2, -4)°F.
- 8.1.3 A functional test as prescribed in section VII shall be performed prior to exposure (if more than 72 hours have elapsed since the last functional test) and within 1 hour after removal from the salt fog environment.

8.2 TEST PROCEDURE

- 8.2.1 No corrosion was detected on the test specimens. All dirt and oily films were removed.
- 8.2.2 The test specimens were placed in the chamber in a manner which would permit the fog to reach all sides of the specimen without condensate dripping on them.
- 8.2.3 The specimens were exposed to the salt fog atmosphere for 240 hours.
- 8.2.4 A functional test (refer to 8.1.3) was performed within 1 hour after removal from the salt fog environment.
- 8.2.5 The specimens were inspected for corrosion caused by exposure to the environment.

8.3 TEST RESULTS

- 8.3.1 Rust and corrosion were present on all test specimens.
- 8.3.2 Specimen 1 actuated and deactuated properly after the salt fog test.
- 8.3.3 Specimens 2, 4, and 7 actuated above the pressures specified in 7.1.1, and specimens 2, 4, 5, and 7 deactuated below the pressures specified in 7.1.2.
- 8.3.4 The insulation resistance of the test specimens was less than one megohm for all the measurements.

- 8.3.5 Test specimen 4 would not actuate initially until approximately 1625 psig was quickly applied. The vendor representatives disassembled the specimen for inspection. Moisture was detected inside the specimen, and the Nylatron bushing had extruded causing the piston to bind. Test specimen 4 was removed from the test program and returned to the vendor.
- 8.3.6 Specimens 1, 2, 5, and 7 were cleaned (externally) and placed in a temperature chamber at 130°F for 2 hours in an attempt to dry them before continuing the tests.
- 8.3.7 Specimens 1, 5, and 7 were cleaned, lubricated with Krytox PR-240AB, and reset by CCSD personnel to the pressures specified in 7.1.1.
- 8.4 TEST DATA
- 8.4.1 Data recorded before and after the salt fog test is presented in tables 8-1 and 8-2, respectively. Insulation resistance data is presented in table 8-3.
- 8.4.2 The dielectric strength (leakage current) was less than 5 milliamps for all test specimens.

Table 8-1. Functional Test Data Obtained Before
Salt Fog Test (75M51766)

Specimen Number	Serial Number	Average Actuation Pressure (psig)	Specified Pressure (psig)	Average Deactuation Pressure (psig)	Specified Pressure (psig min)
1	C20	665	665 (± 10)	613	597
2	C21	665	665 (± 10)	609	597
4	C26	1420	1410 (± 15)	1295	1286
5	C27	1423	1410 (± 15)	1301	1286
7	D10	2837	2850 (± 20)	2683	2586

Table 8-2. Functional Test Data Obtained After
Salt Fog Test (75M51766)

Specimen Number	Serial Number	Average Actuation Pressure (psig)	Specified Pressure (psig)	Average Deactuation Pressure (psig)	Specified Pressure (psig min)
1	C20	667	665 (± 10)	598	597
2	C21	677	665 (± 10)	590	597
4	C26	1512	1410 (± 15)	1153	1286
5	C27	1420	1410 (± 15)	1261	1286
7	D10	3019	2850 (± 20)	2429	2586

Table 6-3. Insulation Resistance of Specimens After Salt Fog Test

Specimen Number	Serial Number	Insulation Resistance (Megohms)				
		Pins A to B	Pins B to C	Pin A to Case	Pin B to Case	Pin C to Case
1	C20	0.14	0.13	0.11	0.06	0.06
2	C21	0.20	0.30	0.13	0.05	0.05
4	C26	0.17	0.10	0.15	0.04	0.04
5	C27	0.07	0.12	0.05	0.03	0.04
7	D10	0.15	0.30	0.08	0.03	0.05

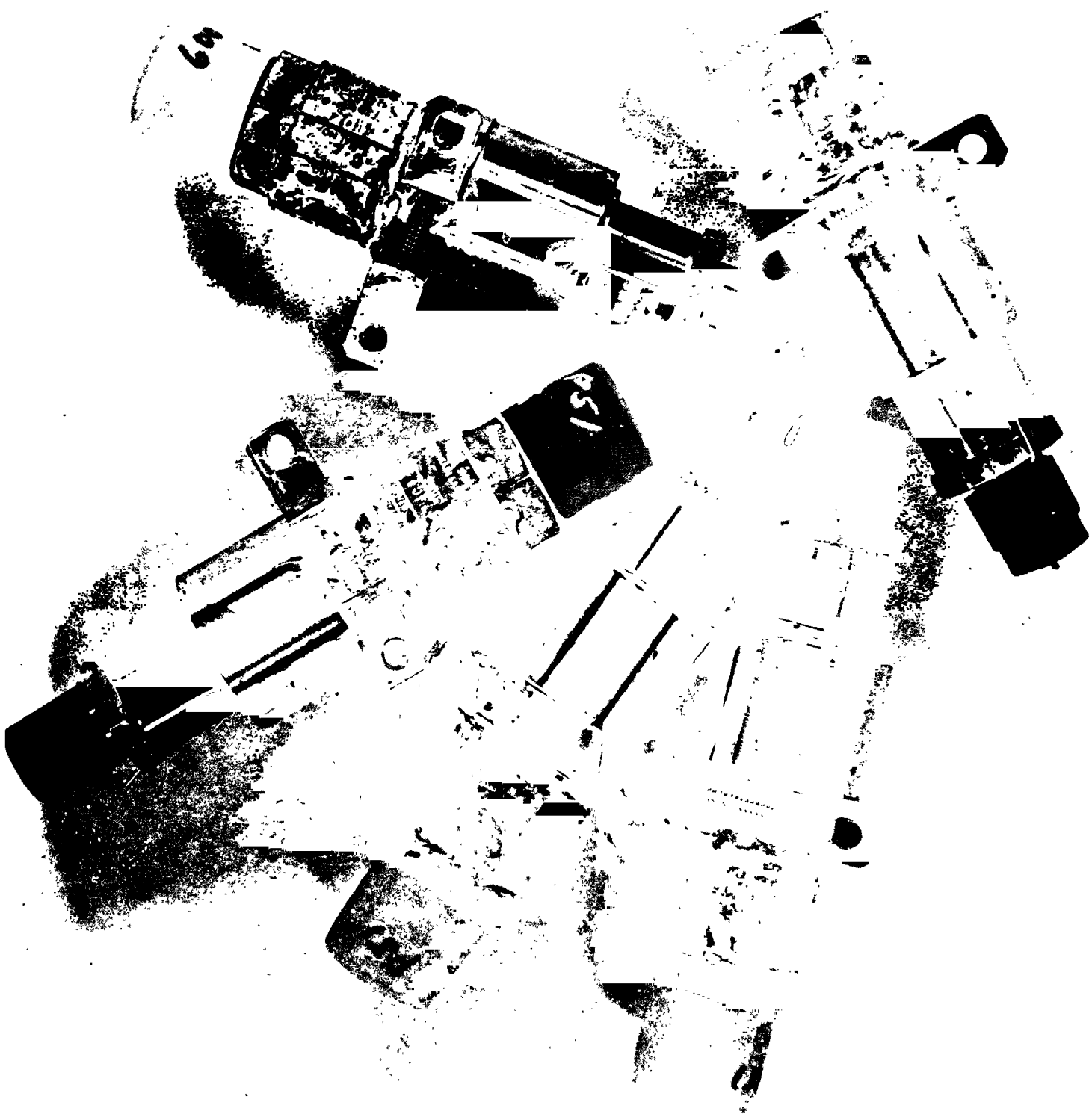


Figure 8-1. Salt Fog Test Specimens

SECTION IX

SEAL LEAKAGE TEST (75M51766)

9.1 TEST REQUIREMENTS

The test specimens shall be pressurized to 4500 psig with gaseous helium and checked for external leakage, using an approved leakage detector solution.

9.1.2 The seal leakage test shall be performed before and after the life cycle test.

9.2 TEST PROCEDURE

9.2.1 The test setup was assembled as shown in figure 3-1, using the equipment listed in table 6-1.

9.2.2 The test specimens were pressurized to 4500 psig and were checked for leaks.

9.3 TEST RESULTS

9.3.1 No leakage of the test specimens was detected.

9.4 TEST DATA

The test data presented in table 9-1 were recorded during the leakage tests.

Table 9-1. Seal Leakage Test Data

Specimen Number	Leakage Before Life Cycle	Leakage After Life Cycle
1	None	None
2	None	None
3	None	None
4	None	None
5	None	None
6	None	None
7	None	None
8	None	*

* Specimen 8 not tested

SECTION X

LIFE CYCLE TEST (75M51766)

10.1 TEST REQUIREMENTS

- 10.1.1 The test specimens shall be subjected to 10,000 cycles of operation. A cycle shall consist of one actuation and one deactuation of the specimen.
- 10.1.2 The contacts of each specimen shall have a 28-VDC, 5-ampere resistance load applied during the life cycle test.
- 10.1.3 A functional test as prescribed in section VII shall be performed prior to the life cycle test (if more than 72 hours have elapsed since the last functional test) and following each 2000 cycles of operation.

10.2 TEST PROCEDURE

- 10.2.1 The test setup was assembled as shown in figures 10-1 and 10-2 using the equipment listed in table 10-1.
- 10.2.2 The resistive load were adjusted to limit the current through the specimen contacts to 5 amperes.
- 10.2.3 The repeat cycle timers were adjusted so that the specimens were actuated for 3 seconds and deactuated for 3 seconds during each cycle.
- 10.2.4 Pressure regulator 4 was adjusted to pressurize specimens 1, 2, and 3 to 700 psig, specimens 5 and 6 to 1500 psig, and specimens 7 and 8 to 2900 psig.
- 10.2.5 The test specimens were monitored for proper operation using the event recorder 14.
- 10.2.6 A functional test was performed after each 2000 cycles of operation.

10.3 TEST RESULTS

- 10.3.1 Each test specimen actuated and deactuated during each cycle of operation.
- 10.3.2 Test specimens 1, 3, 5, 6, and 7 operated within the specified limits during the functional test performed prior to beginning the life cycle test. Test specimen 2 deactuated 2 psi below the specified minimum pressure. See table 10-2.
- 10.3.3 Test specimen 1 operated within the specified limits during the 2000 and 4000 cycle functional tests but did not operate within the specified limits during the remaining life cycle functional tests.

- 10.3.4 Test specimens 2, 5, 6, and 7 did not operate within the specified limits during any of the life cycle functional tests.
- 10.3.5 Test specimen 3 operated within the specified limits during all of the life cycle functional tests.
- 10.3.6 Test specimen 8 operated within the specified limits during the 2000 cycle functional test. After failing to operate properly during the 4000 cycle functional test, it was disassembled for inspection by vendor representatives. The back-up ring was not scarf cut and the O-ring extruded around it thus causing a restriction in the piston movement. The specimen was removed from the test program and returned to the vendor.
- 10.3.7 Test specimen 5 was relubricated after the 2000 cycle functional test but could not be reset properly due to excessive "dead-band". The Sigma nut was damaged during the reset procedure and was repaired prior to continuing the life cycle test. The actuation and deactuation pressures were reset at 1469 psig and 1228 psig, respectively, and the test was continued.
- 10.3.8 Test specimen 7 was relubricated and reset after the 2000-cycle functional test. The actuation and deactuation pressures were reset at 2865 psig and 2614 psig, respectively, and the test was continued.
- 10.4 TEST DATA
- 10.4.1 Test data recorded during the life cycle test are presented in tables 10-2 through 10-8.
- 10.4.2 The insulation resistance was greater than 20 megohms for all test specimens except specimens 2 and 5. See table 10-8 for data recorded during life cycle tests.
- 10.4.3 The dielectric strength (leakage current) was less than 5 milliamps for all test specimens.

Table 10-1. Life Cycle Test Equipment List

Item No.	Item	Manufacturer	Model/ Part No.	Serial No.	Remarks
1	Test Specimen	Sigma-Netics, Inc.	704024	C20, C21, C22	Pressure switch
2	Test Specimen	Sigma-Netics, Inc.	704025	C27, C28	Pressure switch
3	Test Specimen	Sigma-Netics, Inc.	704026	D10, D11	Pressure switch
4	Pressure Regulator	Grove	15-LHX	NA	1000-psi
4	Pressure Regulator	Grove	15LHX	NA	3100-psi
5	Gaseous Nitrogen Supply	NA	NA	NA	6000-psig
6	Pressure Gage	Helicoid	NA	NA	0-to 1000-psig +1% FS accuracy Cal. date 3-7-67
7	Pressure Gage	Helicoid	NA	NA	0-to 3000-psig +1% FS accuracy Cal. date 3-7-67
8	Pressure Gage	Duragauge	NA	NA	0-to 5000-psig +1% FS accuracy Cal. date 12-15-66
9	Hand Valve	Robbins	ANA250-4T	NA	1/4-inch
10	Solenoid Valve	Marotta Valve Corp.	MV100	NA	3000-psi, NC
11	Solenoid Valve	Marotta Valve Corp.	MV109	NA	3000-psi, NC
12	Repeat Cycle Timers	Industrial Timer Corp.	ET-15S	NA	3 seconds each
13	Power Supply	Perkin Electronics	NA	63-293	28-vdc, 40-amp
14	Event Recorder	Techni-Rite Electronics	TR-120	010461	
15	Load Bank	CCSD	NA	NA	5-amp, 28-vdc
16	Ammeter	Simpson	NA	NA	0-to 10-ampere (built into load banks)

Table 10-2. Functional Test Data Obtained Before
Life Cycle Test (75M51766)

Specimen Number	Serial Number	Average Actuation Pressure (psig)	Specified Pressure (psig)	Average Deactuation Pressure (psig)	Specified Pressure (psig min)
1	C20	666	665 (± 10)	623	597
2	C21	656	665 (± 10)	595	597
3	C22	666	665 (± 10)	615	597
5	C27	1395	1410 (± 15)	1300	1286
6	C28	1418	1410 (± 15)	1314	1286
7	D10	2858	2850 (± 20)	2698	2586
8	D11	2860	2850 (± 20)	2640	2586

Table 10-3. Functional Test Data Obtained After
2000 Cycles (75M51766)

Specimen Number	Serial Number	Average Actuation Pressure (psig)	Specified Pressure (psig)	Average Deactuation Pressure (psig)	Specified Pressure (psig min)
1	C20	667	665 (± 10)	617	597
2	C21	649	665 (± 10)	595	597
3	C22	659	665 (± 10)	620	597
5	C27	1409	1410 (± 15)	1270	1286
6	C28	1437	1410 (± 15)	1272	1286
7	D10	2924	2850 (± 20)	2564	2586
8	D11	2868	2850 (± 20)	2633	2586

Table 10-4. Functional Test Data Obtained After
4000 Cycles (75M51766)

Specimen Number	Serial Number	Average Actuation Pressure (psig)	Specified Pressure (psig)	Average Deactuation Pressure (psig)	Specified Pressure (psig min)
1	C20	670	665 (± 10)	600	597
2	C21	660	665 (± 10)	587	597
3	C22	663	665 (± 10)	621	597
5	C27	1444	1410 (± 15)	1192	1286
6	C28	1463	1410 (± 15)	1255	1286
7	D10	2937	2850 (± 20)	2585	2586
8	D11	2943	2850 (± 20)	2569	2586

Table 10-5. Function Test Data Obtained After
6000 Cycles (75M51766)

Specimen Number	Serial Number	Average Actuation Pressure (psig)	Specified Pressure (psig)	Average Deactuation Pressure (psig)	Specified Pressure (psig min)
1	C20	678	665 (± 10)	588	597
2	C21	660	665 (± 10)	575	597
3	C22	663	665 (± 10)	613	597
5	C27	1427	1410 (± 15)	1215	1286
6	C28	1481	1410 (± 15)	1241	1286
7	D10	2590	2850 (± 20)	2575	2586

Table 10-6. Functional Test Data Obtained After
3000 Cycles (75M51766)

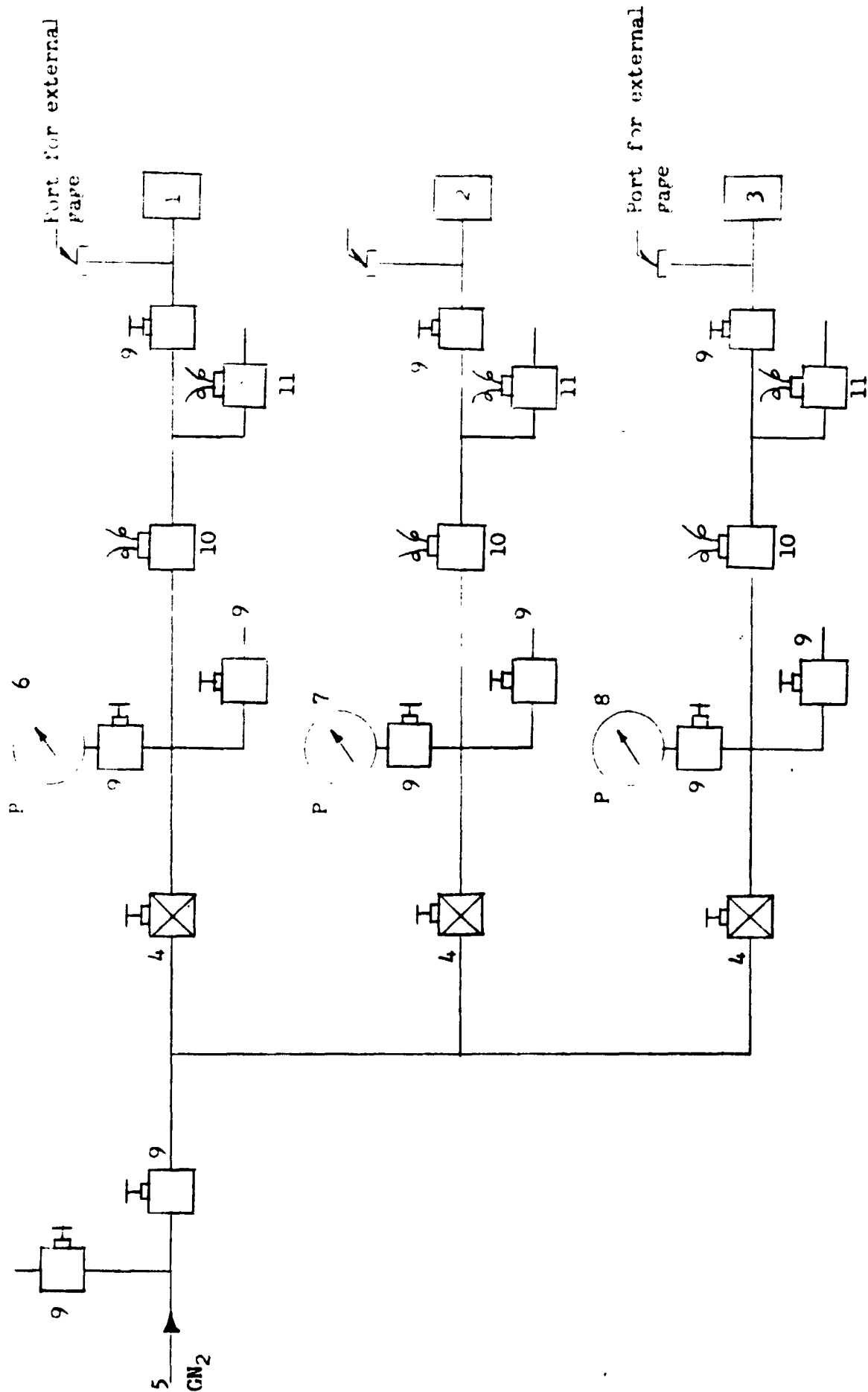
Specimen Number	Serial Number	Average Actuation Pressure (psig)	Specified Pressure (psig)	Average Deactuation Pressure (psig)	Specified Pressure (psig min)
1	C20	685	665 (± 10)	590	597
2	C21	652	665 (± 10)	572	597
3	C22	669	665 (± 10)	615	597
5	C27	1442	1410 (± 15)	1202	1286
6	C28	1452	1410 (± 15)	1220	1286
7	D10	2940	2850 (± 20)	2582	2586

Table 10-7. Functional Test Data Obtained After
10,000 Cycles (75M51766)

Specimen Number	Serial Number	Average Actuation Pressure (psig)	Specified Pressure (psig)	Average Deactuation Pressure (psig)	Specified Pressure (psig min)
1	C20	675	665 (± 10)	590	597
2	C21	655	665 (± 10)	570	597
3	C22	666	665 (± 10)	615	597
5	C27	1439	1410 (± 15)	1210	1286
6	C28	1462	1410 (± 15)	1219	1286
7	D10	2955	2850 (± 20)	2590	2586

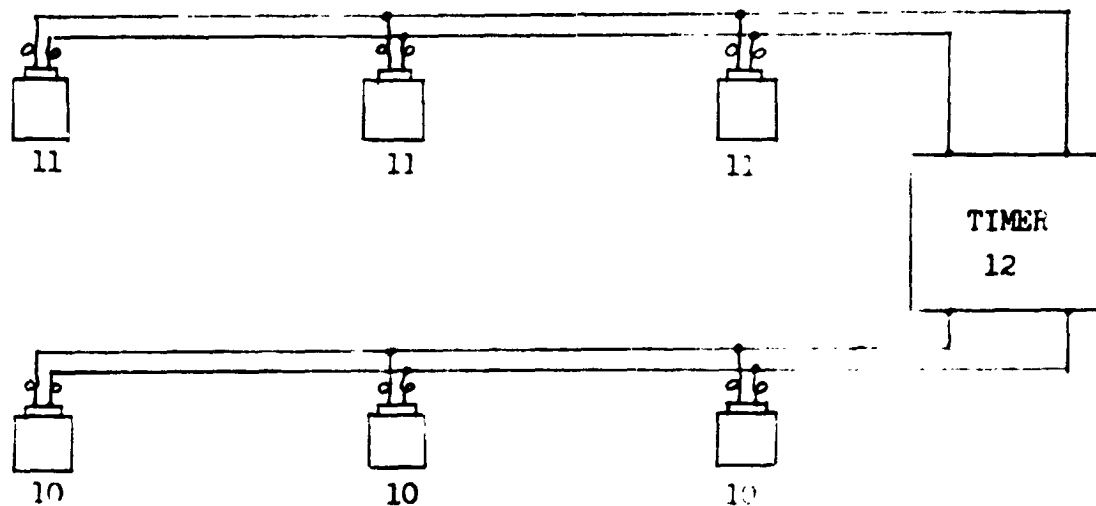
Table 10-8. Insulation Resistance Data Obtained During Life Cycle Functional Tests

Functional Tests Cycles	Specimen Number	Measurement Location	Resistance (megohms)
2000	2	B to C	13
4000	2	B to C	15
4000	5	B to case	12
4000	5	C to case	14
6000	2	A to B	10
8000	2	A to B	10

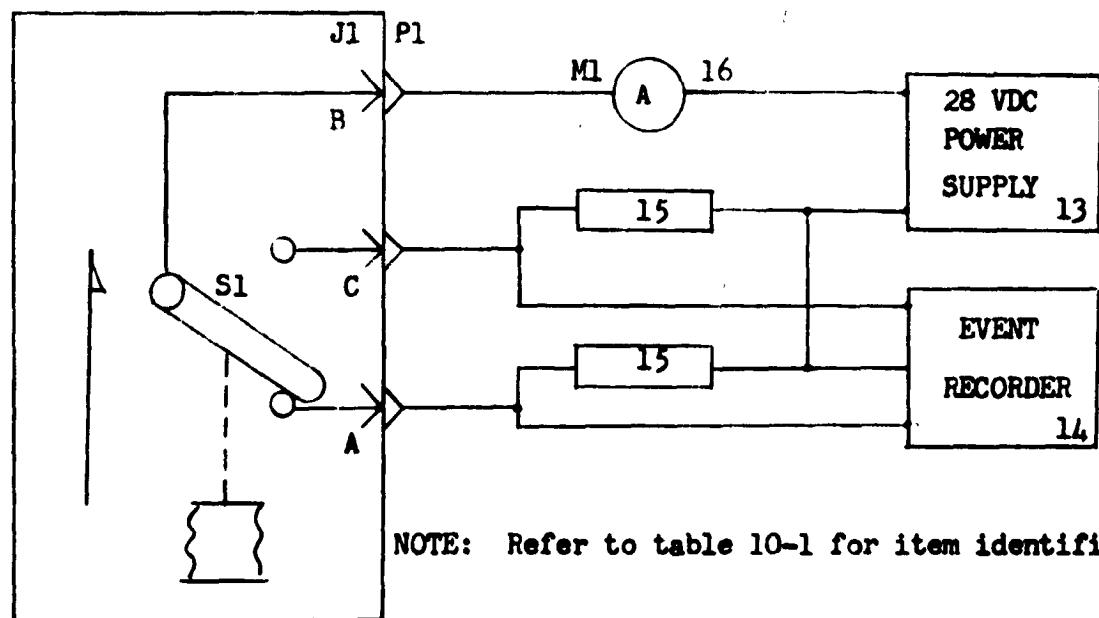


NOTE: Refer to table 10-1 for item identification.
All line sizes 1/4-inch.

Figure 10-1. Life Cycle Test Schematic



a. Solenoid-Timer Connections in Life Cycle Test Setup



b. Connections to Test Specimens - Typical for all specimens

Figure 10-2. Life Cycle Test Wiring Schematic



Figure 10-3. Life Cycle Test Setup

SECTION XI

EXPLOSION TEST (75M51766)

11.1 TEST REQUIREMENTS

- 11.1.1 Test specimens 1, 5, and 7 shall be subjected to an explosion test (ignition proof test) to determine the explosion-producing characteristics of the specimens when operated in an explosive atmosphere.
- 11.1.2 The explosive mixture shall be composed of 32 (+ 5) per cent by volume of hydrogen-in-air, and the test chamber pressure shall be 13.1 psig at a temperature of 160°F (+2, -4°F).
- 11.1.3 The specimens shall be operated while in the explosive atmosphere, using gaseous helium as the pressure medium.
- 11.1.4 A functional test shall be performed at the completion of the test.

11.2 TEST RESULTS

The test specimens operated successfully in the specified explosive atmosphere.

11.3 TEST DATA

- 11.3.1 Functional test data recorded before and after the salt fog test are presented in tables 11-1 and 11-2.
- 11.3.2 The insulation resistance of all test specimens was greater than 20 megohms.
- 11.3.3 The dielectric strength (leakage current) was less than 5 milliamps for all test specimens.

Table 11-1. Functional Test Data Obtained Before
Explosion Test (75M51766)

Specimen Number	Serial Number	Average Actuation Pressure (psig)	Specified Pressure (psig)	Average Deactuation Pressure (psig)	Specified Pressure (psig min)
1	C20	675	665 (± 10)	590	597
5	C27	1439	1410 (± 15)	1210	1286
7	D10	2955	2850 (± 20)	2590	2586

Table 11-2. Functional Test Data Obtained After
Explosion Test (75M51766)

Specimen Number	Serial Number	Average Actuation Pressure (psig)	Specified Pressure (psig)	Average Deactuation Pressure (psig)	Specified Pressure (psig min)
1	C20	675	665 (± 10)	615	597
5	C27	1460	1410 (± 15)	1228	1286
7	D10	2962	2850 (± 20)	2623	2586



OGDEN TECHNOLOGY LABORATORIES, INC.
(FORMERLY UNITED AEROTEST LABS, INC.) DEER PARK DIVISION

UNITED AEROTEST LABORATORIES INC.

COMAC ROAD, DEER PARK, LONG ISLAND, NEW YORK 11729

TEL: 516 MOHAWK 7-7200

TWX: 516-667-6057

30 January 1967

Chrysler Corporation Space Division
Michoud Assembly Facility
P.O. Box 29200
New Orleans, La. 70129

Attention: Mr. B. Claunch

Reference: 1) Chrysler Corp. P.O. NOB35425C
2) Ogden Technology Job No. 7179
3) Pressure Switches P/N 75M51766-4,-5,-6

Gentlemen:

This is to certify that three (3) Pressure Switches, P/N75M51766-4-5-6
S/N C20, C27 and D10 were subjected to an ignition proof test
per Chrysler TP-RE-CCSD-FO-1029-2R.

The pressure switches while operating in the specified explosive
atmosphere did not produce an explosion.

Enclosed are photographs of the test set-up and an equipment
list.

Very truly yours,

OGDEN TECHNOLOGY LABORATORIES, INC.

KS:ek
Enc.



K. Schmitt, Project Engineer



R. Zeibig, Director Quality Assurance





Ignition Proof Test Setup

CUSTOMER CHRYSLER DATE 5 JANUARY 1967
JOB NO. 7179 TECHNICIAN William J. Duffa TEST EXPLOSION

EQUIPMENT LIST

ITEM USED CHAMBER
MANUFACTURED BY UAL
MODEL NO. NONE
SERIAL NO. NONE
UAL NO. NONE
LAST CALIBRATION N/A
NEXT CALIBRATION N/A

ITEM USED THERMOMETER
MANUFACTURED BY WEXLER
MODEL NO. +30 to 400°F
SERIAL NO. NONE
UAL NO. H-129
LAST CALIBRATION 1-20-66
NEXT CALIBRATION 1-20-67

ITEM USED POTENTIOMETER
MANUFACTURED BY LEEDS & NORTHROP
MODEL NO. 9657C
SERIAL NO. 316773
UAL NO. A-51
LAST CALIBRATION 9-27-66
NEXT CALIBRATION 3-27-67

ITEM USED GUAGE
MANUFACTURED BY HEISE
MODEL NO. 0-5000 PSI
SERIAL NO.
UAL NO. H 56 811 R
LAST CALIBRATION 7-27-66
NEXT CALIBRATION 7-27-67

ITEM USED THERMOMETER
MANUFACTURED BY WEXLER
MODEL NO. 1 1/2 WROTH
SERIAL NO. 303413 INFO 1-67
UAL NO. A-318 1-5-67
LAST CALIBRATION 11-14-66
NEXT CALIBRATION 2

ITEM USED GUAGE
MANUFACTURED BY ASHCROFT AMERICAN
MODEL NO. APF 7125
SERIAL NO. 30 PSI
UAL NO. GP 65
LAST CALIBRATION 12-19-66
NEXT CALIBRATION 3-12-67

ITEM USED DC POWER SUPPLY
MANUFACTURED BY INER DESIGNS
MODEL NO. 4005
SERIAL NO. NONE
UAL NO. A-164
LAST CALIBRATION 1-5-67
NEXT CALIBRATION BEFORE USE

ITEM USED FLOWMETER
MANUFACTURED BY BROOKS INSTR
MODEL NO. 5A-1110-10
SERIAL NO. 6502-77016/1
UAL NO. F89
LAST CALIBRATION 1-5-67
NEXT CALIBRATION BEFORE USE

ITEM USED DC VOLT METER
MANUFACTURED BY SENSITIVE RESEARCH
MODEL NO. VP
SERIAL NO. 303413
UAL NO. A 31
LAST CALIBRATION 11-14-66
NEXT CALIBRATION 2-1-67

ITEM USED FLOWMETER
MANUFACTURED BY BROOKS INSTR.
MODEL NO. 6A-1110-10
SERIAL NO. 6501-77014
UAL NO. F87
LAST CALIBRATION 1-5-67
NEXT CALIBRATION BEFORE USE

CUSTOMER CHRYSLER DATE 5 JANUARY 1967
 JOB NO. 7179 TECHNICIAN William J. Zappa TEST Exhaust

EQUIPMENT LIST

ITEM USED GAUGE
 MANUFACTURED BY ASHCROFT AMERICAN
 MODEL NO. 30"-0-60 PSI
 SERIAL NO. —
 UAL NO. SPV 66
 LAST CALIBRATION 12-29-66
 NEXT CALIBRATION 3-29-67

ITEM USED _____
 MANUFACTURED BY _____
 MODEL NO. _____
 SERIAL NO. _____
 UAL NO. _____
 LAST CALIBRATION _____
 NEXT CALIBRATION _____

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 NEXT CALIBRATION _____

APPROVAL
TEST REPORT
FOR

PRESSURE SWITCH

Sigma-Netics, Inc. Part Numbers
704011, 704012, 704013, 704024,
704025, and 704026

NASA Drawing Numbers
75M18354-1, 75M18354-4, 75M18354-7, 75M51766-4,
75M1766-5, and 75M51766-6

SUBMITTED BY:

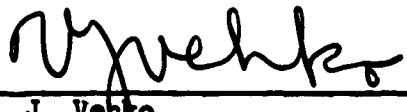


C. L. Foy
Test and Evaluation Section

APPROVALS



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